

## SECTION 16482

### MOTOR CONTROL CENTERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Extent of alternating-current motor control center (MCC) work is indicated by drawings and schedules.
- B. Types of motor control center components specified in this section include the following:
  - 1. Starter units.
  - 2. Controllers.
  - 3. Disconnects.
  - 4. Overload protection.
  - 5. Overcurrent protection.

#### PART 2 - PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide motor control centers of one (1) of the following:
  - 1. General Electric Co.
  - 2. Square D Co.
  - 3. Cutler-Hammer (Eaton Metal).
- B. The Contractor shall verify that the size of the equipment supplied by the selected manufacturers does not exceed the available mounting space.

##### 2.2 MOTOR CONTROL CENTERS AND COMPONENTS

- A. General: Provide motor control centers and ancillary components of sizes, ratings, Classes, Types and characteristics indicated; which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, as required for complete installation and as specified herein.
- B. Motor Control Center enclosure shall be NEMA 1 and units shall be mounted front-of-board. Wiring shall be NEMA Class I, Type B. Each motor control center shall consist of one (1) or more vertical sections bolted together to form a rigid free standing assembly and shall be designated to permit future additions, changes or regrouping of units by the purchaser. Motor control center shall meet the minimum requirements of the latest published standards of NEMA.
- C. Horizontal and vertical bus bars shall be constructed of silver plated copper. Bus bars shall be braced for 42,000 rms symmetrical amperes. Incoming line feeder conductors shall consist of cables.
- D. Vertical Sections: Vertical sections shall be formed of 13-gauge hot rolled steel with uniform blemish free surfaces. Top and bottom structural parts shall be 10-gauge for a strong and rigid

assembly. End closing plates shall be 12-gauge and unit parts and doors shall be 14-gauge. Base channels 1-1/2-inch x 3-inches shall be provided constructed of rugged steel. Steel removable lifting angles 2-1/2-inches x 2-inches shall be provided on the top of the sections.

1. Each section shall be approximately 90-inches high excluding lifting angles and base channels. It shall be approximately 20-inches deep and 20-inches wide.
  2. End sections shall have end closing plates which can be removed for the addition of future sections. The top plate shall be of a removable one-piece construction for added convenience in cutting conduit holes. Removable blank plates flanged on all four sides and having captive screws shall cover all unused unit spaces.
  3. Main Lug Compartments shall be provided complete with suitable main lugs to accommodate users incoming cables. The compartment shall be covered by a hinged door for convenient access and be equipped with an engraved nameplate for identification purposes.
- E. Horizontal Wireways: Adequate conduit entrance space and wire entry room shall be provided at both the top and bottom of each section. A cross sectional area not less than 28 sq. in. with an opening between sections of not less than 11 sq. in. A bottom horizontal wireway height of not less than 9-1/4-inches shall extend through the length and depth of the control center section with openings between sections.
- F. Vertical Wireways: A vertical wire trough located on the right hand side of each standard section and having a cross sectional area of not less than 19 sq. inches shall extend from the top horizontal wire trough to the bottom horizontal wire trough for the purpose of routing user's motor and control wires to the control units.
- G. Disconnect Operators: A rugged flange mounted operator handle shall be supplied for each switch or breaker. To prevent false circuit indication this mechanism shall be engaged with the switch or breaker at all times, regardless of unit door position. The operator handle shall have a conventional up down motion with the down position as OFF. For added safety, it shall be possible to lock this handle in the OFF position with up to three (3) 3/8-inch diameter shackle padlocks. For added recognition, the operator handle shall be color coded to display red in the ON position and black in the OFF position. The operator handle shall be interlocked with the unit door so that the disconnect cannot be switched to the ON position unless the unit door is closed. It shall be possible to defeat this interlock by a deliberate act of an electrician should it be desired, to observe the operation of the operator handle assembly. This interlock shall also prevent opening the unit door unless the disconnect is in the OFF position. A defeater for this action shall also be provided in the event an electrician must gain access to the unit without interrupting the service. Provide auxiliary contacts (DPDT) installed on disconnect switch or circuit breaker operating mechanism. Auxiliary contact to provide disconnecting means for external control power.
- H. Starter Units: NEMA rated and NEMA labeled magnetic starters shall be furnished for a control voltage of 120V. The coil must be removable without disturbing the power connections. Thermal overload relays on starter shall be of the block type manual reset design with individually replaceable thermal units in each phase. Provide one (1) normally open and one (1) normally closed auxiliary contacts on each starter in addition to the seal-in contact.
1. Molded case circuit breaker (MCCB) switches shall be used for starters.

2. Each starter unit shall be provided with [HOA selector switch and [green] [red] LED running pilot light] [control devices as indicated on drawings]. [Running pilot lights shall be push-to-test type].

I. Molded Circuit Breakers:

1. Molded case circuit breakers shall be approved for motor protection and conform to the applicable requirements, of NEMA AB 1 and UL 489. The circuit breakers shall be manually-operated, shall be quick-make, quick-break, common trip type, and shall be of automatic-trip type unless otherwise specified or indicated on the drawings. Operate all poles of each breaker simultaneously by means of a common handle. The operating handles shall clearly indicate whether the breakers are in "On," "Off," or "Tripped" position and shall have provisions for padlocking in the 'Off" position. Provide personnel safety line terminal shields for each breaker. The circuit breakers shall be products of only one manufacturer, and shall be interchangeable when of the same frame size.

J. Trip Units:

1. Except as otherwise noted, the circuit breakers, of frame sizes and the trip unit ratings as shown on the drawings, shall be provided with combination thermal and instantaneous magnetic trip units. The Government reserves the right to change the indicated trip ratings, within frame limits, of the trip devices at the time the shop drawings are submitted for approval. The breaker trip units shall be interchangeable and the instantaneous magnetic trip units shall be adjustable on frame sizes larger than 150 amperes. Nonadjustable instantaneous magnetic trip units shall be set at approximately 10 times the continuous current ratings of the circuit breakers.

2. 480-volt AC Circuits:

- a. Circuit breakers for 480-volt or 277/480-volt ac circuits shall be rated 600 volts ac, and shall have an UL listed minimum interrupting capacity of 42,000-symmetrical amperes at 480 volts ac.

K. Control Transformers: Provide a separate control transformer with primary ratings to match MCC service and 120V secondary for each magnetic starter.

L. Equipment/System Identification: Provide equipment/system identification nameplates complying with Division 16 Basic Materials and Methods Section Electrical Identification, in accordance with Motor Control Schedule on drawings.

1. Each switch shall be equipped with engraved plastic nameplates identifying its load.

M. Finishes: Thoroughly clean interior and exterior prior to coating of MCC, including bolted joints, with rust inhibiting prime coat. Provide two (2) finish coats of manufacturer's standard color baked-on enamel finish.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Examine areas and conditions under which motor control centers are to be installed and substrate, which will support motor control centers. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.2 INSTALLATION OF MOTOR CONTROL CENTERS

- A. Install motor control centers as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, NEMA's Std Pub/No. ICS-2 and NECA's "Standard of Installation."
- B. Coordinate with other electrical work including wiring/cabling and raceway work, as necessary to interface installation of motor control centers with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B.

### 3.3 ADJUSTING AND CLEANING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finishes.

### 3.4 GROUNDING

- A. Provide equipment grounding connections for motor control centers as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

### 3.5 FIELD QUALITY CONTROL

- A. Prior to energization of motor control centers, check with insulation resistance tester for proper values of phase-to-phase and phase-to-ground insulation resistances. Log that data and submit to Engineer.
- B. Prior to energization of circuitry, check control center electrical circuits for continuity and for short-circuits.
- C. Subsequent to wire/cable and raceway hook-ups, energize motor control center circuitry, check each motor for proper phase rotation and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

END OF SECTION